

CLAIMS:

1. An exhaust heat power generation apparatus comprising:
a thermoelectric converting unit that converts thermal energy of
exhaust gas into electric energy;

5 a heat exchange unit provided on one surface of the thermoelectric
converting unit to conduct the thermal energy of the exhaust gas that flows through an
exhaust pipe; and

a cooling unit provided on the other surface of the thermoelectric
converting unit to cool the thermoelectric converting unit, wherein the cooling unit
10 has a rigidity set to a highest value among those of the thermoelectric converting unit,
the heat exchange unit and the cooling unit.

2. The exhaust heat power generation apparatus according to claim 1,
wherein:

the heat exchange unit includes a heat exchange fin for conducting the
15 thermal energy of the exhaust gas and a base having one surface on which the heat
exchange unit is placed, and the other surface on which the thermoelectric converting
unit is placed;

the exhaust pipe includes a main body that forms a frame of an exhaust
passage to which the base is attached, and the heat exchange fin provided therein;

20 the exhaust passage is constructed by the exhaust pipe and the heat
exchange unit; and

the base has a rigidity set to a highest value in a structure of the
exhaust passage.

3. The exhaust heat power generation apparatus according to claim 2,
25 wherein the main body of the exhaust pipe is formed of a material exhibiting a
thermal expansion ratio lower than that of the heat exchange unit.

4. The exhaust heat power generation apparatus according to claim 3,
wherein the main body of the exhaust pipe is formed of a stainless steel.

5. The exhaust heat power generation apparatus according to claim 3,
30 wherein:

the main body of the exhaust pipe is provided in a center of the exhaust
heat power generation apparatus, the thermoelectric converting unit is provided on an
outer periphery of the heat exchange unit attached to the main body of the exhaust
pipe, and the cooling unit is provided on an outer periphery of the thermoelectric

converting unit;

an elastic member is provided on an outer side of the cooling unit; and
an elastic system for fixing the thermoelectric converting unit is
formed, in which a pressure is applied to the cooling unit externally by the elastic
5 member.

6. The exhaust heat power generation apparatus according to claim 5,
wherein:

the thermoelectric converting unit includes a module formed of a
plurality of thermoelectric elements; and

10 a unit of the elastic system is structured based on the module.

7. The exhaust heat power generation apparatus according to claim 5,
wherein the elastic member includes a spring and a compression member which are
one of in point contact and line contact with each other.

8. The exhaust heat power generation apparatus according to claim 2,
15 wherein the heat exchange fin in the exhaust pipe has different pitches among fins
thereof.

9. The exhaust heat power generation apparatus according to claim 8,
wherein the heat exchange fin is formed of a material partially exhibiting different
heat conductivities.

20 10. The exhaust heat power generation apparatus according to claim 2,
wherein each of the heat exchange unit and the main body of the exhaust pipe has a
variable configuration such that a direction in which the heat exchange unit deforms
becomes opposite to a direction in which the main body of the exhaust pipe deforms.

11. The exhaust heat power generation apparatus according to claim 2,
25 wherein:

the main body of the exhaust pipe is provided in a center of the exhaust
heat power generation apparatus, the thermoelectric converting unit is provided on an
outer periphery of the heat exchange unit attached to the main body of the exhaust
pipe, and the cooling unit is provided on an outer periphery of the thermoelectric
30 converting unit;

an elastic member is provided on an outer side of the cooling unit; and
an elastic system for fixing the thermoelectric converting unit is
formed, in which a pressure is applied to the cooling unit externally by the elastic
member.

12. The exhaust heat power generation apparatus according to claim 11, wherein the elastic member includes a spring and a compression member which are one of in point contact and line contact with each other.

5 13. The exhaust heat power generation apparatus according to claim 11, wherein:

the thermoelectric converting unit includes a module formed of a plurality of thermoelectric elements; and

a unit of the elastic system is structured based on the module.

10 14. The exhaust heat power generation apparatus according to claim 13, wherein the elastic member includes a spring and a compression member which are one of in point contact and line contact with each other.

15 15. The exhaust heat power generation apparatus according to claim 14, wherein each of the heat exchange unit and the main body of the exhaust pipe has a variable configuration such that a direction in which the heat exchange unit deforms becomes opposite to a direction in which the main body of the exhaust pipe deforms.